Remarks on *Rising Above the Gathering Storm*

Statement of

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before the

Committee on Science
U.S. House of Representatives

for

The Hearing on
Science, Technology, and Global Economic Competitiveness

20 October 2005

Good afternoon, Mr. Chairman and members of the Committee. My name is William (Bill) Wulf and, since 1996, I have been on leave from the University of Virginia to serve as President of the National Academy of Engineering (NAE).

Founded in 1964, the NAE provides engineering leadership in service to the nation. It operates under the same congressional act of incorporation that established the National Academy of Sciences, signed in 1863 by President Lincoln. Under this charter the NAE is directed "whenever called upon by any department or agency of the government, to investigate, examine, experiment, and report upon any subject of science or art [technology]." The NAE's 1998 strategic plan, however, goes beyond this reactive, "whenever called upon", role to one in which we are to "Promote the technological health of the nation …". It is much in the latter spirit that I am here today.

I am particularly delighted to be here in the company of Norm Augustine, former Chairman of the NAE, to testify on what I believe to be *the most important* (as opposed to urgent) issue facing our country. I was not a member of Norm's Committee, but I participated in its initial meeting and tracked its progress closely, so I first want to acknowledge and thank all of the stellar committee members for the enormous energy and creativity that went into producing the report. I hope that the Science Committee will appreciate that the Academies' committee's willingness to spend countless hours on this report was the result of their depth of concern over our nation's future.

I cannot hope to represent the content of "Rising Above the Gathering Storm" as well or as fully as Norm Augustine or Roy Vagelos, so I won't try – but I would like to draw attention to three points.

First, unfortunately the problem is a "creeping crisis".

Unfortunately the problems we are concerned about don't have a Sputnik-like wake-up call.

You all know the storied procedure for boiling a frog. They say that if you drop a frog in boiling water, it will jump out. But, if you put a frog in cool water and heat it very slowly, the frog won't jump out, and you'll get a boiled frog. The theory is that each small, incremental rise in temperature is not enough of a crisis to make the frog react. I don't know if this story is true, but it fits my purpose—the slowly warming water is a creeping crisis for the frog!

Our creeping crisis is not a slow, one-dimensional change like the frog's water temperature. We are facing a number of problems—each one like a tile in a mosaic. No one of these problems by itself creates the sort of crisis that provokes action. But if you stand back and look at the collection of problems, a disturbing picture emerges—a pattern of short-term thinking and a lack of long-term investment. It's a pattern for preserving the status quo rather than reaching for the next big goal. It's a pattern that presumes that we in the United States are *entitled* to a better quality of life than others and that all we have to do is circle our wagons to defend that entitlement. It's a pattern that does not balance the dangers and opportunities in current circumstances.

I do not have the time to discuss all the tiles in this mosaic, and I would be largely redundant with the report that is the subject of this hearing if I did, but they include:

- The dramatic decline in industry-based basic research.
- The flat-to-declining federal support of research in the physical sciences and engineering.
- The increasingly short-term, risk-averse nature of the research that is supported.
- The discouraging effect on foreign students and scholars of our current visa policies, and its impact on our ability to get the world's best and brightest to come to the U.S. and contribute to our security and prosperity.
- The draconian proposals for handling of "deemed exports" in basic research, and their chilling impact on long-term basic research at universities.
- The rapid growth in the use of the category of "sensitive but unclassified" information, and its impact on the free flow of scientific information.

Second, nonetheless the problem is both important and widely recognized.

Although the problems depicted in "Rising Above the Gathering Storm" may not have a Sputnik-like wake-up event, that does not mean they are unimportant. Quite the contrary; in my view collectively they are the most important issue currently facing the United States. I am hardly alone in that view; there is an increasingly wide recognition of it. Below are references to recent reports from a variety of sources that reflect this deep concern:

- From the National Academies[1, 2]
- From the private sector[3, 4, 5, 6, 7, 8]
- From Government agencies[9, 10, 11, 12], and
- From Academia[13, 14]

Despite the differing perspectives of the authoring organizations, there is surprising consistency among these reports. They all identify problems like the tiles in my mosaic as representing *serious* long-term problems for the country – problems that require action now! As is said in the American Electronics Association (AeA) report[3]:

> "We are slipping. Yes, the United States still leads in nearly every way one can measure, but that does not change the fact that the foundation on which this lead was built is eroding. Our leadership in technology and innovation has benefited from an infrastructure created by 50 years of continual investment, education and research. We are no longer maintaining this infrastructure."

In my view, the erosion alluded to by the AeA, if unchecked, will lead to a poorer quality of life for our grandchildren—and quite possibly to a world that is less secure and less free.

Third and finally, it's all about innovation and the multi-faceted environment that supports innovation.

There is wide agreement in the reports cited above that the US ability to innovate has been the source of its prosperity—and hence that ensuring our ability to continue to innovate is central to our future prosperity and security. Each of these reports proposes specific policy options to do this—many of them are similar, but few are identical. I think that is because, in my view, there is no simple formula for innovation. There is, instead, a multi-component "environment" that collectively encourages, or discourages, innovation. Just to mention a few of the components of this environment:

- There must be a vibrant research base.
- There must be an educated workforce.
- There must be a culture that permits and even encourages risk-taking.
- There must be a social climate that attracts the best and brightest to practice engineering – whether from within the country or outside it.
- There must be "patient capital" available to the entrepreneur.
- The tax laws must reward investment.
- There must be adequate and appropriate protection for intellectual property.
- There must be laws and regulations that protect the public while also encouraging experimentation.

To prosper in the future we must attend to *all* the components of this innovation environment—and in particular we need to be sure that they are attuned to the current and future technologies rather than those of the past (when many of the components of the environment were first created).

In summary

By almost any objective measure, the U.S. is doing very well at this moment. But, the prosperity and security that we now enjoy is the result of decades of investment, research and education. We now see a pattern, a "mosaic", of disinvestment, of a retreat from bold research, and of a declining interest of American youth in education in science and engineering. We see a pattern suggesting a shift from creating the new to protecting the status quo. No single tile in this mosaic is going to ruin the American economy – which perhaps makes it all the more dangerous. There is the chance that we won't take action until the consequences become apparent in a decade or two, at which point it will be too late.

Thank you for the opportunity to testify, Mr. Chairman. I would be pleased to answer any questions the Committee might have**.**

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